

**HOLMES SAFETY ASSOCIATION**

# **BULLETIN**

**December 2000**



*"Be Safe for the Season"*

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The Holmes Safety Association Bulletin contains safety articles on a variety of subjects: fatal accident abstracts, studies, posters, and other health and safety-related topics. This information is provided free of charge and is designed to assist in presentations of groups of mine and plant workers during on-the-job safety meetings. For more information visit the MSHA Home Page at [www.msha.gov](http://www.msha.gov).

**Please Note:** The views and conclusions expressed in Bulletin articles are those of the **authors** and should not be interpreted as representing official policy or, in the case of a product, represent endorsement by the **Mine Safety and Health Administration**.

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*Keep Us in Circulation--Pass Us Along*

# Stay Out - Stay Alive Facts

Purpose of the **Stay Out - Stay Alive Program** is to make children and adults aware of the dangers found at active and abandoned mine sites through a public safety campaign. The Mine Hazard Awareness Campaign is a partnership of federal, state, private organizations, and businesses.

Mining is an important part of the American economy. Over half of the electricity generated in this country comes from coal. Sand, gravel, limestone, and other rock products are used in the construction industry. Salt keeps wintry roads free of ice. Gold, silver, iron, copper, and many other minerals are essential to our national prosperity.

Mines are located in every state—from small sand and gravel operations to complex underground coal, salt, limestone, or metal mines, to extensive surface mines that use some of the largest industrial equipment ever built. There are about 14,000 active and over 500,000 abandoned mines in the Nation. As cities and towns spread into the surrounding countryside and more people visit remote locations, the possibility of contact with an active or abandoned mine increases.

There are dangers at both active and abandoned mine sites. The men and women who work at mine sites are trained to work in a safe manner. For the unauthorized visitor on an

active mine site, or the hiker, off-roader, or rock hound enjoying outdoor recreation, the hazards are not always apparent. Active and abandoned mine sites have proved to be an irresistible—and sometimes deadly—draw for children and adults.

- **Vertical shafts** can be hundreds of feet deep. At the surface, shafts can be completely unprotected, hidden by vegetation, or covered by rotting boards.

- **Horizontal openings** may seem sturdy, but rotting timbers and unstable rock formations make cave-ins a real danger. Darkness and debris add to the hazards.

- Lethal concentrations of **deadly gases** (methane, carbon monoxide, carbon dioxide, and hydrogen sulfide) can accumulate in underground passages.

- Unused or misfired **explosives** can become unstable and deadly—vibrations from a touch or footfall can trigger an explosion.

- Excavated vertical cliffs—**highwalls**—in open pit mines and quarries can be unstable

and prone to collapse.

- **Hills of loose material in stock or refuse piles** can easily collapse to bury an unsuspecting biker or climber.

- **Water-filled quarries and pits** can hide rock ledges, old machinery, and other hazards. Because of the depth, the water can be dangerously cold; steep, slippery walls make exiting these “swimming holes” very difficult.

In 1999, 17 people died while seeking adventure on mine property. The majority drowned in water-filled quarries and pits; others died from all-terrain vehicle accidents, falls, and suffocation.

Any community with active or abandoned mines, quarries, or pits could become the scene of the next tragedy. For more information, please contact: Amy Louvier, U.S. Department of Labor, Mine Safety and Health Administration, 703-235-1372, [alouvier@msha.gov](mailto:alouvier@msha.gov), or visit the MSHA web site: [www.msha.gov](http://www.msha.gov).

MSHA has a toll free hotline for reporting unsafe access to active and abandoned mine sites: 1-800-499-1038.

*The following list of active and abandoned mine fatalities of non-employees was compiled from various reports and newspaper articles from Jan 1, 2000 to October 31, 2000.*

DATE	STATE	NATURE OF FATALITY	SEX	AGE	MINE STATUS
1/30/2000	PA	DROWNING-VEHICLE CRASHED THROUGH ICE ON WATER-FILLED PIT	M	30	ABANDONED
1/30/2000	PA	DROWNING - VEHICLE CRASHED THROUGH ICE ON WATER-FILLED PIT	M	28	ABANDONED
3/2/2000	NM	FALL DOWN 200 FOOT SHAFT	M	18	ABANDONED
5/14/2000	GA	DROWNING/STRUCK HEAD - JUMPING FROM ROCK QUARRY CLIFF	M	-	-
5/29/2000	TX	DROWNING - ROCK QUARRY	M	-	-
6/12/2000	WI	TRUCK ACCIDENT AT GRAVEL PIT	F	16	ABANDONED
6/12/2000	WI	TRUCK ACCIDENT AT GRAVEL PIT	M	18	ABANDONED
6/16/2000	PA	ATV OVER HIGHWALL IN LIMESTONE QUARRY	M	24	ACTIVE
6/19/2000	FL	65' DIVE INTO WATER-FILLED LIMEROCK PIT- LANDED ON FACK	M	30	-
6/21/2000	NC	DROWNING - ROCK QUARRY	M	18	ABANDONED
6/26/2000	NC	DROWNING - ROCK QUARRY	M	19	ABANDONED
7/02/2000	IA	DROWNING - INFLATABLE RAFT DEFLATED ON QUARRY POND	M	18	ABANDONED
7/02/2000	PA	DROWING - ROCK QUARRY	M	19	ABANDONED
7/02/2000	MD	DROWNING - ROCK QUARRY	F	24	CONVERTED TO SWIM CLUB
7/02/2000	IA	DROWNING - ROCK QUARRY	M	18	ABANDONED
7/03/2000	IL	DROWNING - VICTIM PANICKED	M	-	ACTIVE
7/04/2000	TX	DROWNING - SAND AND GRAVEL MINE	M	20	INACTIVE
7/09/2000	KY	DROWNING - SAND AND GRAVEL MINE	M	34	ABANDONED
7/23/2000	KY	DROWNING - STRIP MINING PIT	M	17	ABANDONED
8/01/2000	WI	DROWNING - ROCK QUARRY	M	16	ABANDONED
8/22/2000	WI	DROWNING - GRAVEL PIT	M	18	ABANDONED
9/24/2000	TN	VICTIM FELL INTO LIMESTONE QUARRY	M	-	ABANDONED
10/01/2000	WI	VICTIM JUMPED OVER LIMESTONE QUARRY HIGHWALL IN APPARENT SUICIDE	M	-	ACTIVE
10/28/2000	VA	QUARRY DROWING	M	17	INACTIVE

## ***Part 46 Training Assistance Available***

***Training Modules available on the web***

**Training Modules were developed cooperatively by MSHA and members of the sand, gravel, and crushed stone industry.** Contributors such as Gifford-Hill and Company, Inc., National Gypsum Company, National Stone Association, The Splines Education Center, Martin-Marrietta Corp., W.W. Boxley Co., and others along with MSHA designed an Instruction Guide to supplement existing health and safety training programs. The Instruction Guide is formatted into a series of nineteen modules that MSHA has set up on the website: <http://www.msha.gov/training/part46/ig40/ig40.htm>. The material is not intended to cover all specific jobs at any

given operation. Modules will be added, and current modules on the website will be revised and updated as time goes on. Individual modules in this Instruction Guide are designed to be used separately. The modules can be kept together in a three ring binder when not in use. General information and training recommendations will be included at the end of each module.

The Instruction Guide is offered in two formats for downloading from the web, **Wordperfect 8.0** and **PDF**.

*(See next page)*



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*Separate Modules of  
IG-40*

- Module 1  
"Starting the Plant"
- Module 2  
"Plant Clean-up"
- Module 3  
"Plant Shutdown"
- Module 4  
"Plant Operation"
- Module 5  
"Maintaining Conveyor Systems"
- Module 6  
"Plant Repair"
- Module 7  
"Welding and Cutting"
- Module 8  
"Equipment Lock-Out Procedures"
- Module 9  
"Electrical Procedures for Non-Electricians"
- Module 10  
"Truck Haulage"
- Module 11  
"Ground Control"
- Module 12  
"Inspecting and Replacing"
- Module 13  
"Replacing the Drive Chain or Belt on a Screw Conveyor"
- Module 14  
"Manual Handling of Materials"
- Module 15  
"Using an Overhead Hoist to Lift  
or Handle Parts or Materials"
- Module 16  
"Handling Material with a Shop Overhead Traveling  
Crane"
- Module 17  
"Primary Crushing Operation"
- Module 18  
"Operating Drilling Equipment"
- Module 19  
"Transportation, Use, and Storage of Explosives"

## MSHA - POST ACCIDENT INVESTIGATION REMEDIES

### *“Making Unplanned Air Changes is Like Looking Down the Barrel of a Loaded Gun”*

Many mine explosions have been a result of a major interruption of the mine ventilation system. One such interruption, cutting beyond regulation, can be safely controlled by employing sound engineering practices. Cutting or mining beyond regulation is defined as making an air connection into an unregulated air course or into an air course controlled by regulation other than the regulation that controls the active unit. Never cut beyond regulation without controls. Before cutting thru into mine workings or another air split, make sure you follow these safeguards.

Establish a pressure relationship by:

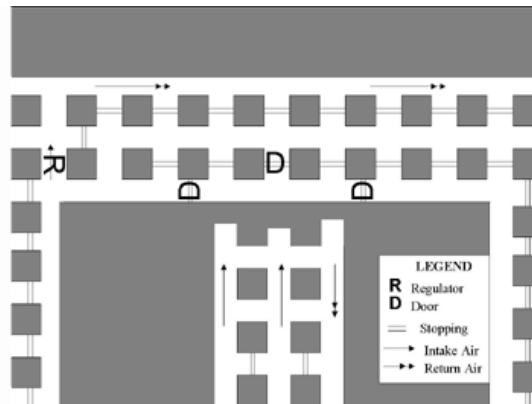
- Conducting an altimeter survey to determine the pressure differential between the active working section and the “cut thru” area.

- Taking magnehelic readings across doors and thru regulators to determine total pressure at various points, thereby establishing pressure relationships.

- Mining to within 10 feet of the proposed “cut thru” with the continuous miner, and then:

- ◆ Drilling a borehole thru the remaining coal (a drill that runs off the power take off of a scoop or roof bolter is ideal for this purpose).

- ◆ Pushing copper tubing thru the borehole and attaching rubber tubing on the end nearest you. Attach this end to a magnehelic to determine the “pressure drop” or pressure differential. Select a magnehelic with the proper range and calibrate it before readings are taken.



After a pressure relationship has been established:

- “Box in” the area that you will be mining into. Brattice curtain can be used if the pressure differential is less than 0.3 inches of water. “Box in” the area with masonry block if the pressure differential is greater than 0.3 inches of water. Remember to install access doors in the stoppings and **be sure to hang them the right way** (keep in mind the new pressure relationship).

- Make sure doors are left open to provide ventilation until you “Cut Thru”. Wire or post doors open and clearly mark

on the door “**LEAVE DOOR OPEN**”.

- Examine the area that is “boxed in” for methane accumulations. Have the examiner call out to the active unit supervisor when it is clear to “cut thru” with the miner. Right before “Cut Thru” close the doors. If there is enough differential, the area will be ventilated thru leakage. If there isn’t enough differential, put a hole in a stopping or loosen the line brattice. Examine the “boxed in” area for any methane accumulations after the “cut thru”.

*Directorate of Technical Support Accident Reduction Program*

## **Surge Pile Accident Prevention**

Avoiding surge pile accidents requires a combination of good safety practices and effective training of surge pile workers. The following measures represent current best practices for safe surge pile operations. These measures have been arrived at by studying surge pile accidents and by compiling ideas that are now in use at various surge pile operations. They are presented here so that the ideas can be shared with mine operators. If these practices are followed, fatalities from surge pile accidents could be eliminated.

**MOBILE EQUIPMENT**  
**1. PROVIDE EQUIPMENT CABS STRONG ENOUGH TO RESIST BURIAL PRESSURE, OR USE REMOTE-CONTROLLED EQUIPMENT.**

The prime purpose of surge pile safety measures is to prevent equipment from becoming buried in a surge pile. However, the mobile equipment used on the piles should be equipped with fully-enclosed cabs designed to allow the operator to be rescued in the event an accident does occur. This means that the cab

must be able to withstand being buried in the pile. This is the pressure needed to provide a backup margin of safety in the event that a breakdown occurs in the normal safety procedures. An alternative approach would be to use remote-controlled equipment.

In most fatal surge pile accidents, it has been found that the coal broke or pushed in the cab windows and filled the cab. Based on the accident history, it appears that the cab windows should be strong enough to resist when being buried in at least 35 feet of coal. For a density of 80 pounds per cubic foot, this corresponds to a pressure of about 20 psi.

The windows of dozer cabs can be made to withstand burial pressure by a combination of installing supports for the glass, improving the edge support for the glass, and using high-strength window material, such as chemically-strengthened glass. An adequate factor of safety should be provided on the window strength to account for possible variations in conditions.

A common accident scenario is for a bulldozer to fall backwards into a hidden void when bridged-over material collapses. In these cases, structural damage can occur to the cab from the impact. If the existing roll over protective structure would not protect the rear window and cab in this

situation, then to help absorb the impact additional structural protection should be installed behind the cab.

As an alternative to providing a cab strong enough to resist burial pressure, technology is now available to allow the use of remote-controlled equipment on surge piles. This approach would remove the operator from the potential hazards of operating on the pile.

**2. EQUIP THE CAB TO ALLOW A RESCUE IN THE EVENT OF AN ACCIDENT.**

Provide self-rescuers, radio communication, and lighting so that the operator can be rescued in the event of an accident. Equipment should only be operated on surge piles with the doors and windows closed to prevent the entry of coal into the cab in the event of an accident. Equipment operators should wear their seat belts at all times while operating on the pile in case the equipment would suddenly roll or fall into a hidden cavity. Door latches need to be properly maintained to help ensure that the doors do not come open from the impact of falling into a void. The radio antenna should be mounted where it would not be damaged in the event of an accident. Some mines are providing chemical lights in the cabs as a backup measure. A surge pile rescue plan should be prepared which addresses who will be



notified and what equipment will be used in the event of a surge pile accident. One self-rescuer can last up to 4 hours, depending on how efficiently the person uses the oxygen. At least two rescuers should be supplied to allow time to dig out the equipment.

### 3. PROVIDE THE MOBILE EQUIPMENT OPERATOR WITH THE CAPABILITY TO SHUT DOWN THE FEEDER AND STACKER BELT FROM THE CAB.

This capability can be provided by a radio control that is located in the cab and activated by the operator pressing a button. Use of a tilt switch, which would automatically shut down the feeders and belts, if the equipment rolls or falls backward, could also be considered. In the event of an accident, this capability would help minimize the burial depth of the equipment.

#### **FEEDERS**

### 4. PROVIDE GATES ON FEEDERS SO THAT COAL CANNOT DISCHARGE WHEN THE FEEDER IS NOT ACTIVATED.

To ensure that coal feeds only when intended, feeders should have gates which are closed when the feeder is not being used to draw coal. In some cases, coal has fed through ungated vibratory feeders even when the feeders were not activated. This can create a dangerous condition

because an equipment operator would not suspect that a cavity would form over a feeder that had not been activated. Gates should be provided unless it can be clearly shown that the design of the feeder precludes the possibility of gravity feeding.

Such an evaluation should consider the possible variation in the size and properties of the feed material and the condition of the feeder. If gates are not provided based on the feeder design precluding gravity feeding, checks should still be made on a regular basis to verify that material is not feeding from non-active feeders while the belt is running.

### 5. PROVIDE A MEANS FOR THE FEEDER OPERATOR TO DIRECTLY OBSERVE THE CONDITIONS AND ACTIVITIES ON THE TOP OF THE SURGE PILE.

The person who controls the feeders should be able to observe the top of the surge pile to ensure that coal is feeding properly when a feeder is activated. This is needed so that the feeder operator has a direct and immediate way of telling whether a bridged-over condition develops. If a feeder is activated and the feeder operator doesn't see the coal being drawn into the feeder when and where it should be, then the operator should activate a signal, such as a flashing red light, above that feeder, and verbally warn equipment operators of the danger. Closed-circuit television should be used to provide the

feeder operator with visual coverage of the pile whenever the top of the pile cannot be directly seen from the feeder control room.

A second reason for having the feeder operator being able to see the pile is to allow that person to periodically make a visual check of the safety of the equipment operators on the pile, as well as ensure that no one is in the area of a feeder when it is to be activated.

Some operations monitor the weight of the material on the belt, as a way to be warned if a cavity develops. The combination of being able to see the top of the pile and monitor the weight of material on the belt, would allow the feeder operator to detect and provide timely warning of the development of dangerous bridging conditions.

### 6. MARK THE FEEDER LOCATIONS.

The location of feeders should be clearly marked, such as by using large markers or lights suspended directly above the feeder locations. A high-powered light shining down on the feeder location would be effective for nighttime operations. Where pile height can vary significantly, a pulley system could be used to allow the height of the markers to be adjusted

*(See next page)*

with the pile height.

**7. PROVIDE VISUAL INDICATORS OF WHICH FEEDERS ARE OPERATING.**

There should be visual indicators to show the mobile equipment operators which feeders are being used to draw coal. Preferably, a system of lights is used such as using a yellow light to indicate when the feeder is activated, a blue light to indicate that the feeder is not operating, and a flashing red light to warn of the potential for a cavity above the feeder.

**SAFE OPERATING PRACTICES**

**8. AVOID OPERATING EQUIPMENT OVER THE FEEDERS.**

Many of the accidents have occurred when a bulldozer fell into a hidden void while pushing coal away from the stacker. Operating equipment over a feeder both promotes bridging by compacting the surface of the pile and exposes the operator to the potential hazard of a hidden cavity. With the feeder locations marked, the pile should be operated, to the extent possible, in a manner such that equipment does not pass over a feeder.

When operating over feeders equipped with gates, take the following steps:

1. Operate the feeder and verify that coal is feeding properly into the feeder;
2. Close the feeder door and physically tag and lock it

outand;

3. Fill in the drawoff cone. After completing this verification process, the feeder can be traveled over as long as the gate remains physically locked and tagged.

**9. CONSIDER MOBILE EQUIPMENT SAFETY IN THE DESIGN OF NEW SURGE PILE FACILITIES.**

Whenever new surge pile facilities are constructed, the design should include features to minimize the potential hazards to mobile equipment operators. In particular, measures to eliminate or at least minimize the need to travel near feeders when pushing coal away from the stackers should be incorporated.

**10. USE SAFE PRACTICES WHEN PUSHING TO A DRAWHOLE.**

When pushing material to a drawhole, equipment operators should always operate facing and directly toward the feeder location. Since the edge of the drawhole is unstable, operators should never backup near, or operate along the edge of, a drawhole.

The higher the pile is, the larger the diameter of the drawoff cone.

To assist equipment operators, markers can be placed on the stacker tubes to indicate the height of the coal and a chart can be prepared, using the typical angle of withdrawal of the material, to provide opera-

tors with guidance on how far back from the feeder they should stay for a given height of pile. This chart can also be used by equipment operators to provide guidance on how close to a feeder they can come when a cavity is suspected over the feeder.

If coal is feeding properly and a normal cone of depression is being created, then material can be pushed to the edge of the drawhole.

However, a condition can develop where only a relatively small hole opens up over the drawpoint. This may indicate that the coal is feeding down a "chimney" about the drawpoint, or what appears to be a chimney could actually be a small opening over the center of a large cavity. A dozer operator could be endangered by pushing coal all the way to this hole because if the hole is an opening at the top of a large cavity, then the weight of the dozer could collapse the cavity. If coal is not feeding in a conical shaped drawhole, then a cavity should be suspected and the condition should be immediately investigated and corrected by digging in from the side of the pile.

**11. KEEP THE DRAWHOLE NEARLY FULL DURING LOAD-OUT OPERATIONS.**

During load-out operations, the capacity of the equipment pushing to the drawholes should be matched to the load-out rate so that the drawholes

can be kept fairly full. This is safer than having to push to the edge of a deep drawhole. It is a good practice for dozers to be positioned in a safe place on the pile when load-out operations begin. This allows the equipment operators to observe whether the material feeds properly.

#### 12. PROHIBIT PERSONS FROM WALKING ON A SURGE PILE.

Persons should be prohibited from walking on a surge pile unless appropriate safety precautions, such as the use of safety lines, are taken. Equipment operators should be instructed not get off of their equipment while it is on a surge pile. A particular concern is for the safety of persons, such as maintenance or contractor personnel, who may not normally work around the pile and may not be familiar with the dangers. Ensure that such persons are trained about the dangers. Post warning signs around the surge pile to identify the danger area and reinforce the training information.

#### 13. OPERATE SAFELY AT NIGHT OR UNDER CONDITIONS OF POOR VISIBILITY.

Adequate illumination should be provided for operations after dark.

Work with the mobile equipment operators to determine where best to install lighting to minimize glare problems. Water vapor coming

off the coal can make visibility difficult or impossible. The use of infrared cameras may be useful in these types of situations. When visibility is inadequate the operation of mobile equipment should be suspended until conditions permit adequate visibility.

#### 14. PROVIDE FOR COMMUNICATIONS.

There should be provisions for radio communication between everyone who either works on the pile, affects the pile, or supervises pile operations.

#### 15. COMMUNICATE WHEN A CAVITY IS SUSPECTED.

If a cavity is suspected, the condition should be immediately reported to all employees in the affected area and to the supervisor in charge of stockpiling operations. Cavities should be eliminated immediately or the area should be dangered-off. A warning signal such as a blinking red light above the feeder should be used to indicate to everyone that a potential cavity exists and that no one should go near that feeder.

#### 16. USE SAFE PROCEDURES TO ELIMINATE A CAVITY.

Cavities need to be eliminated by a method which doesn't expose the workers to a hazard. Measures such as the use of high pressure air or water should be used from the reclaim tunnel where possible. If such measures are not

successful, then the cavity should be eliminated by excavating into the pile. This activity should be under the direction of a supervisor and should be started a safe distance off to the side of the pile and away from other feeders. In performing this work, material needs to be removed from low enough on the pile that the cavity is broken into on the side, rather than near the top where the operator could be endangered. Use of a long-reach excavator should be considered.

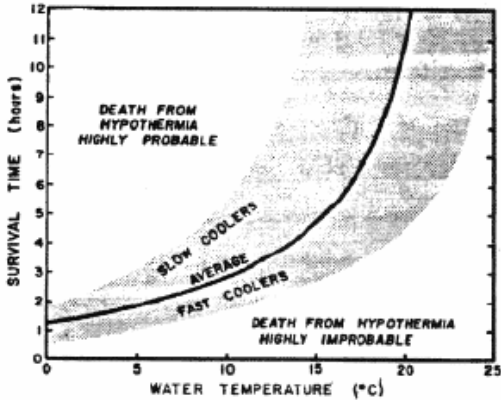
#### *TRAINING*

#### 17. PROVIDE ADEQUATE HAZARD TRAINING FOR ALL SURGE PILE WORKERS.

All employees who work on surge piles need to be trained on surge pile hazards. Hazard training also needs to be provided for anyone who might only occasionally do work associated with the pile, such as maintenance personnel or contractors.

# Hypothermia Hypothermia Hypothermia

*In water/ On land*



### Hypothermia In Water

Hypothermia is defined as a body core temperature less than 35 degrees Celsius. Decreased consciousness occurs when the core temperature falls to approximately 32 to 30 degrees.

Heart failure is the usual cause of death when the core temperature cools to below 30 degrees.

The body loses heat to the water about 30 times faster than in air.



*Get on top of an over-turned boat or any wreckage!*

The positions **HELP** and **HUDDLE** are designed to reduce body heat loss in water.



**H.E.L.P.**

*Arms close to sides of the chest, legs crossed & pulled up closing the groin area.*



**HUDDLE**

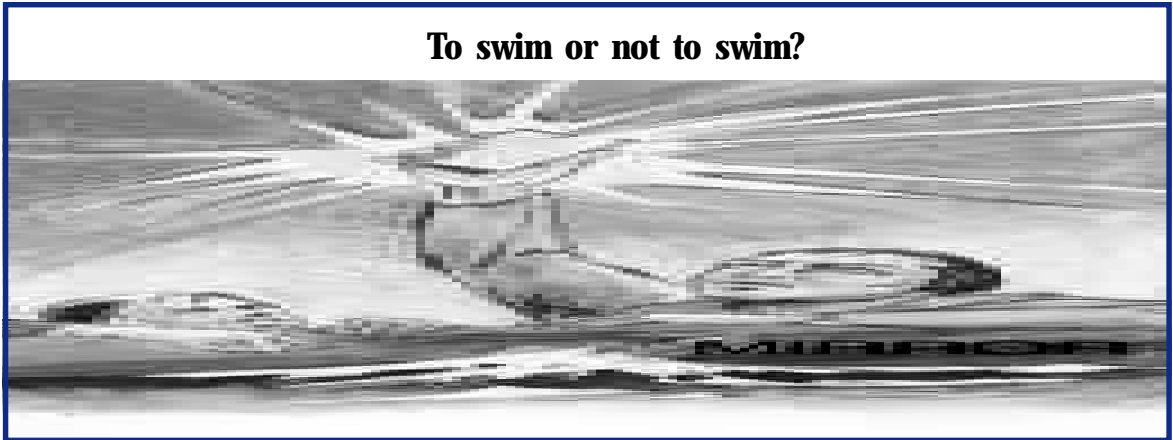
*In the huddle position, keep close together and still - to keep colder water out. The huddle helps small children survive longer!*



**FLARES**

**Help Search and Rescue crews find you!  
Keep calm and make yourself visible  
Carry a WHISTLE with you!  
(A Fox 40 is highly recommended)**

*(See next page)*



Swimming is an option but this leads to faster heat loss and exhaustion. Even a strong swimmer would not be able to swim more than one kilometer in calm water. Cramps and hypothermia develop more quickly. Usually a victim becomes semiconscious and is likely to drown.

Swimming increases heat loss (increase by 35-50%) and is not recommended if you are more than one kilometer away from shore. Adopt a heat conserving strategy (help or huddle) instead.

Consider your circumstances carefully before deciding to swim. Is there a favorable

current to assist you, etc..

Drown proofing and treading water also lead to rapid heat loss. Avoid if possible and wear a personal floating device! Do not remove clothing or shoes; they provide insulation (a jacket can trap air and assists floating).

### *Signs of Hypothermia*

#### **Hypothermia on Land**

Body heat loss—"Hypothermia"—can be through radiation, respiration, evaporation (wetness) convection (wind) and conduction

**Wind and Wetness**—take away body heat faster than it can be produced.



**Get victim into dry clothes and keep in a horizontal recovery position. If conscious, give a warm drink.**

**NO coffee or tea - and NEVER ALCOHOL!**  
**If in doubt, treat as severe hypothermia.**  
**Remember to handle the victim very gently.**  
**Get help; attract attention.**



*(See next page)*

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*Carry a WHISTLE with you! (A Fox 40 is highly recommended)*



*Assist search and rescue crews to find you on the ground.*



*Keep calm and make yourself visible.*



*Assist Search and Rescue crews spot you from the air.*



*(See next page)*

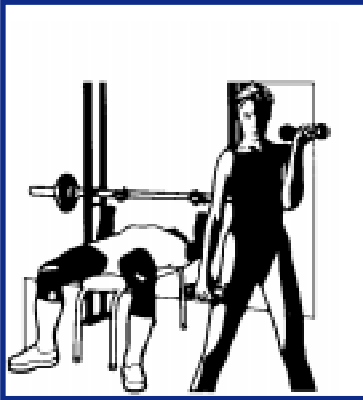
*If you find yourself in a survival situation, the first thing to do is prevent further heat loss.*

*Look for or make a shelter; keep out of the wind.*



*For more information*

This article taken from the Hypothermia Prevention, Recognition and Treatment website; <http://hypothermia.org>



## Wellness

### Cardiovascular Fitness

Miners routinely undertake physically demanding tasks, such as crawling or duck walking in low seams; walking up and down slopes; climbing over overcasts and rock falls; climbing ladders; going through mandors; and carrying heavy equipment. Extremes of heat and cold are routine.

Studies show that this type of work requires high levels of cardiovascular fitness. This critical component of health and performance measures the ability of your heart and lungs to supply working muscles with oxygen, and your muscles' ability to use that oxygen to produce energy. As such, your cardiovascular fitness largely determines your ability to participate in vigorous physical activities for extended periods of time.

#### **THE BODY'S FUEL SUPPLY**

All movements and activities require the contraction of

muscles. In order for a muscle to contract, fuel must be available for energy. Otherwise, the contraction cannot occur.

There are two basic types of fuel that your muscles use for energy. One is called anaerobic (which means "without oxygen"). The second type is called aerobic (which means "with oxygen"). Muscles are always using a combination of both anaerobic and aerobic fuels for energy, but the proportion of each depends upon the intensity and duration of the activity being performed.

#### **Anaerobic Fuel**

This fuel comes from carbohydrates in the diet and is stored within the muscles as glycogen. When glycogen is burned as fuel, it releases a great deal of energy, so it is used primarily for high intensity activities. In other words, the more vigorous the activity, the more glycogen is being used for energy.

Muscles can store only a limited amount of glycogen. Since the supply of anaerobic fuels is limited, large proportions of anaerobic fuels are available only for relatively brief activities (under 10 minutes). For vigorous activities that last longer than 10 minutes, a greater proportion of fuel must come from the aerobic system.

#### **Aerobic Fuel**

This fuel comes from the fat store in the body that break down and enter the bloodstream, traveling to the muscles where they are burned and

converted to energy in the presence of oxygen.

#### **Anaerobic Fuel**

- Energy source: glycogen stores in muscles

- Vigorous activities

#### **Aerobic Fuel**

- Energy source: fat (transported through bloodstream)

- Low/moderate intensity activities

The aerobic system is always working, supplying energy to the body. In fact, the aerobic system is responsible for resupplying the muscles glycogen stores when they get low.

Muscles cannot store aerobic fuel. When burned, fat releases less energy than glycogen. Thus, the aerobic system is used primarily for low to moderate intensity activities. However, the amount of fat available within the body is very large; thus the source of energy for the aerobic system is practically limitless. Larger proportions of aerobic fuels are used for relatively long activities (over 10 minutes).

For low intensity activities (such as walking), the **aerobic** system can easily supply enough fuel to meet the demand. However, for high intensity activities (such as certain mining tasks), most energy is initially provided by the **anaerobic** system, which has

*(See next page)*

limited fuel supplies. If the muscles' demand for fuel outstrips that supply, the anaerobic system has reached its "ceiling," and aerobic fuel sources must be relied upon to make up the difference. Since aerobic fuel has less energy, either the intensity of the activity must decrease or exhaustion will occur.

**Oxygen Consumption**

In the lungs, oxygen combines with red blood cells to be transported through the bloodstream. As needed, the oxygen exits from the bloodstream for use by tissues such as working muscles. When fat is burned to produce energy, oxygen must be present. Since the amount of available fat stored for fuel in the body is very large, **the limiting factor in the processing of aerobic energy is the ability to transport and use oxygen.**

Because the aerobic system depends on the bloodstream to deliver oxygen, the ability to uptake, transport, and use oxygen is referred to as "cardiovascular fitness." A higher level of cardiovascular fitness means a higher "ceiling" to the aerobic system's ability to supply fuel and energy. As cardiovascular fitness increases, this ceiling increases as well.

This concept is also called "oxygen consumption," which is represented scientifically as "VO<sup>2</sup>" (the Volume of Oxygen consumed every minute). VO<sup>2</sup> is

expressed in milliliters of oxygen per kilogram of lean body weight per minute (ml/kg/min.) To simplify things, it is easier to refer to oxygen consumption in terms of "units" of oxygen consumed.

Any activity involving muscular work requires that your cardiorespiratory system be able to transport oxygen through your bloodstream to feed working muscles. Generally, the more vigorous the activity, the more "units" of oxygen your bloodstream must deliver every minute. For example:

- A relatively easy job (such as sweeping a stairwell) might require 20 units of oxygen per minute.
- A harder job (such as digging ditches) might require 35 units of oxygen every minute.

The higher your level of cardiovascular fitness, the more units of oxygen your body is able to transport and use. If you are "out of shape" (i.e., your cardiovascular fitness level is too low to deliver this amount of oxygen), then your muscles will literally "starve" for oxygen, and they will tire out.

**Maintaining Cardiovascular Fitness**

Once you've developed a sufficient level of cardiovascular fitness, you must continue to follow a regular exercise program to maintain this level. No exercise, or insufficient

exercise, causes a progressive loss of the cardiovascular fitness you've gained. As someone once said, if you don't use it, you'll lose it.

Furthermore, numerous studies show that cardiorespiratory capacity in both miners and the general population decreases with age. Cardiac output is reduced approximately one percent per year after maturity, or 25-45 percent by age 65, due to declines in maximal attainable heart rate, stroke volume, and oxygen extraction by working muscles. A substantial portion of this decline is due to life-style. The decline may be reduced to 20 percent with moderate physical activity and to 10-15 percent with long-term, high-intensity exercise programs.

Your goal as a miner is to keep your level of cardiovascular fitness at, or above, the minimum required for your occupation.

**Merely performing the duties of a miner probably will not develop or maintain the fitness required for this occupation. Only a regular program of physical conditioning can accomplish this goal.**

## *Safety First*

Even if you are born to do a job, it doesn't necessarily mean that you're going to automatically do it safely.

Remember no mater how many times you've done a job before, be sure to think the whole thing through before you start.

- ✓ You've carefully thought out all the angles.
- ✓ You've done it a thousand times.
- ✓ It comes naturally to you.
- ✓ You know what you're doing.
- ✓ It's what you've been trained to do your whole life.
- ✓ Nothing could possibly go wrong, right?



This safety thought, was submitted to the bulletin by Doyle D. Fink, District Manager MNM South Central District.

December 2000

## *Electronic System for Filing Miner Training Plans Now Available*

The U.S. Department of Labor's Mine Safety and Health Administration (MSHA) has developed an electronic filing system that enables mine operators and independent contractors to prepare training plans via MSHA's home page ([www.msha.gov](http://www.msha.gov)). According to federal regulations, mine operators and contractors must have an MSHA-approved plan for training new miners, experienced miners who are newly employed by a mine operation, and miners undertaking new tasks. They are not obligated, however, to submit their plans to MSHA.

This high-tech approach certainly will make it easier for mine operators to prepare their training plans under the new Part 46 regulation, which went into effect in October 2000," said Davitt McAteer, assistant secretary of labor for mine safety and health. Part 46 of the Code of Federal Regulations covers approximately 10,000 aggregate operators and 100,000 miners.

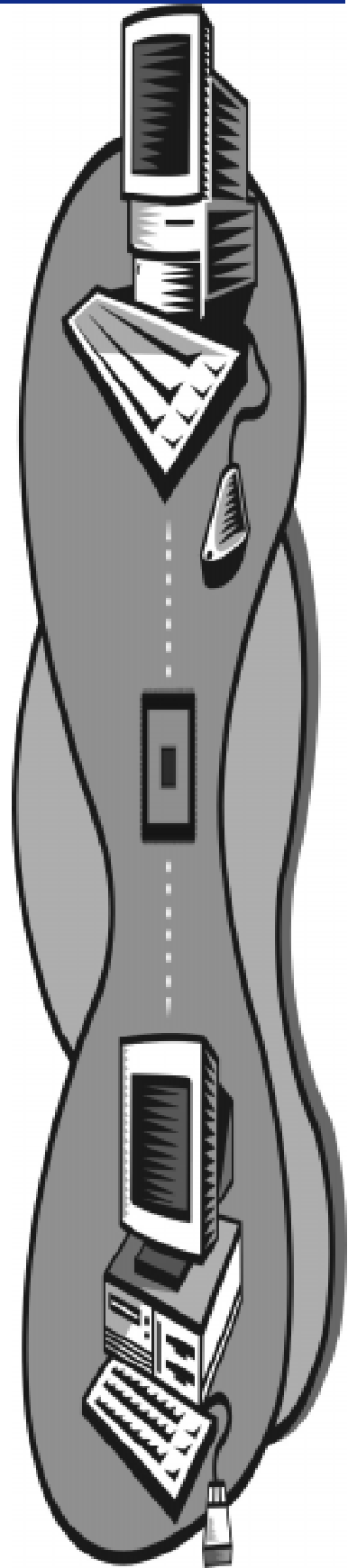
Electronic preparation has many advantages," said McAteer. "The online instructions are user-friendly, and allow mine operators to develop and maintain records that are consistent in format and design and easier to complete, update, or revise."

The electronic filing mechanism includes an introduction to the system, general requirements, step-by-step instructions, and links to other helpful resources, such as federal regulations, policy issues and training products available from the Mine Health and Safety Academy.

Mine operators can select specific teaching methods, course materials and evaluation techniques from a list of program modules. All that's necessary to access the system is a mine or contractor identification number (ID). A temporary number will be generated for organizations without an ID number.

Electronic filing capabilities for mine operator and contractor training plans required under Part 48 became available in March of 2000.

The electronic training plan system is available at [www.msha.gov](http://www.msha.gov). Choose "Forms and Online Filings," followed by "Online Training Plans."





## **Miner's Lunch Bucket**

***Recipe for your appetite***

### **Miner's Breakfast**

- 4 large russet potatoes boiled, peeled and cubed**
- 9 pieces bacon, fried crisp and crumbled**
- 4 tablespoons butter**
- 1/2 bell pepper, chopped**
- minced garlic to taste**
- salt and pepper**
- 8 eggs, lightly beaten**
- 1 cup grated cheddar cheese**

**Preheat oven to 350.**

**Melt butter in a skillet, add potato cubes and bell pepper and brown slightly. Add garlic to potatoes. Add salt and pepper to taste. Pour eggs over potatoes and cook until eggs form soft curds, stirring constantly. Mix in crumbled bacon. Sprinkle grated cheese over the top. Place skillet in oven or under broiler until cheese is melted.**

**Serves 6.**

This recipe comes from the Old Miner's Lodge, Park City, Utah. It can be found on the Pamela Lanier's [travelguides.com](http://travelguides.com) Recipe website.

## *First Mining Fatality?*

*Taken from MESA magazine  
March/April 1976  
By Robert E. Barrett*

Archeologists cannot positively determine where mining first began in America, but evidence suggests that it dates back to the “Old Copper Culture” of the Upper Great Lakes, particularly around Michigan and Wisconsin.

Records indicate that long before Columbus, American Indians were mining salt in underground tunnels, quarried flint, turquoise and other hard-rock substances from cliffs, in exposed strata and in caves, and dug copper in open pits.

Evidence of the earliest known mining fatality in this country was discovered in 1935 by two Mammoth Cave guides while exploring the cave. Squeezing through a narrow passageway between the large rocks, one of the men, to his amazement, suddenly found his hand resting on the head of a mummy. Its body, was partly hidden beneath a huge slab of rock. Recognizing the importance of their discovery, they left it undisturbed, and Dr. Alonzo W. Pond was rushed to the scene. Dr. Pond’s impressions were recorded in Natural History in 1937:

“Many years of archeological exploration on four continents had given me more than my share of “firsts”, but nothing gave me the thrill I experienced as I sat on the narrow ledge in Mammoth Cave with the discoverers and saw with my own eyes the perfectly preserved body of that prehistoric miner trapped at his work centuries ago.”

“Nothing had been disturbed. The ledge was covered with loose, dry sand over which had settled fine, black soot from the torches of ancient and modern “cavers.”

“In the tragic tableau before us, time had stopped centuries ago. With the vent of death and the subsequent drying of the man’s body the scene had remained unchanged. Here was preserved one of the most complete chapters in the life of prehistoric peoples . . . .”

Anthropologists have since established that the Indian, who has become known as “Lost John,” died about 2,300 years ago. Their investigations indicate that he accidentally kicked out a keystone that was holding up a six to seven-ton block of limestone, and was crushed. The Indian was chipping minerals from the wall about two miles inside the cave. Today the area is still referred to as “Lost John Cave.”





## Mining Our History

*An Overview of Disaster Anniversaries*  
by *Melody Bragg*

### 110 Years Ago Inundation

Number 1 Slope  
Nanticoke, PA

December 18, 1885

At about 10 o'clock in the morning, a large body of quicksand and water broke through the roof into the Ross vein workings causing the death of twenty-six miners. The cave broke in near the solid face of a counter gangway on the apex of an anticlinal or saddle. The bodies of the entombed men were never recovered.

### 105 Years Ago Explosion

Cumnock Mine  
Cumnock, NC

December 19, 1895

An explosion in slope No. 1 of this mine killed all 37 men in that section and 2 men in the slope No. 2 section. Survivors

were brought out in cages from the 465-foot shafts. It is believed that gas present in the mine was ignited by open lights of the miners.

### Explosion

Nelson Mine  
Dayton, TN  
December 20, 1895

The fireboss had found gas in three places and "marked them out." He left the mine and the men entered. It was expected that the men would "brush out" the gas from their working places. Of the 113 men and 20 mules in the mine, 28 men and 16 mules were killed when gas was ignited by open lights.

### 90 Years Ago Mine Fire

Leyden Mine  
Leyden, CO

December 14, 1910

A fire occurred in the Leyden Mine on this date which resulted in the death of ten men, all of whom were probably suffocated by the smoke from the fire, as no single man was found 500 feet from his working place.

### Haulage

Lick Fork Mine  
Thacker, WV

December 31, 1910

Eleven men were in an empty car ascending the slope from the

bottom and were drawn to the surface counter balanced by four cars going down. The operator lost control of the trip. On reaching the surface, one man realized what was happening, leaped from the car, and escaped with miner injury. The other 10 men stayed in the car and the men and car were dashed against the drum and headhouse, instantly killing all the men.

### 75 Years Ago Explosion

Overton No. 2 Mine  
Irondale, AL

December 10, 1925

A day shift of 108 men and 16 mules were in the mine at the time of the explosion. The explosion originated in 6 right and extended to most of the workings between 7 right and 3 left and right, resulting in the death of 52 men and serious injury to 3 others.

### Explosion

Wilkeson Mine  
Tacoma, Washington

December 14, 1925

A section foreman and a chute starter attempted to start a chute that was blocked by placing a stick of 60-percent gelatin dynamite on a large chunk and firing it with fuse. Five miners were killed with the report of the shot was followed by a blast of wind and fire.

## ***New Membership or Address Changes?***

***For address changes and new subscription requests, contact:***

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**NOTICE:** We welcome any materials that you submit to the Holmes Safety Association Bulletin. For more information visit the MSHA Home Page at [www.msha.gov](http://www.msha.gov). If you have any color and black/white photographs that you feel are suitable for use on the front cover of the Bulletin, please submit them to the editor. We cannot guarantee that they will be published, but if they are, we will list the contributor(s). Please let us know what you would like to see more of, or less of, in the ***Bulletin***.

**Reminder:** The District Council Safety Competition for 2000 is underway - please remember that if you are participating this year, you need to mail your quarterly report to:

**Mine Safety & Health Administration  
Educational Policy and Development  
Holmes Safety Association Bulletin  
P.O. Box 4187  
Falls Church, Virginia 22044-0187**

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